

Methods Development to Protect Non-Nursery Commodities from Imported Fire Ant Infestations

Ronald D. Weeks, Jr., USDA, APHIS, PPQ, CPHST, Soil Inhabiting Pests Laboratory, Gulfport, MS 39501

Project Summary

Non-nursery commodities that have been implicated in the transportation of imported fire ant (IFA) species (*Solenopsis* spp.) include; apiary (honey bee) equipment used for crop pollination, pine straw for urban landscaping needs, and baled hay for cattle and horse forage. Non-nursery commodities require indirect treatment methods such as protection barriers around sensitive commodities. Most nursery commodities such as grass sod, and potted plants can be treated with chemicals directly.

Currently, bees and associated bee equipment (Fig. 1) are not listed as regulated items within the Federal IFA Quarantine, however many states vigorously inspect and regulate these items coming from IFA infested states. Bee hives and apiary equipment are under consideration for addition to the Federal Imported Fire Ant Quarantine (Federal Code of Regulations, Title 7, Part 301.81). No quarantine treatments have been approved for assuring that transported hives are IFA free.

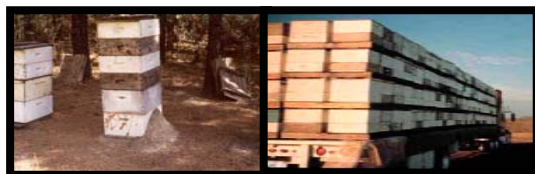


Fig. 1. Red imported fire ant mound built-up against bee hives and bee hives ready for transport

Hay is a federally regulated item, under the Federal Imported Fire Ant Quarantine (7CFR 301.81). Hay stored in direct contact with the ground cannot be moved outside the quarantine (Fig. 2). No quarantine treatments have been approved for assuring that transported hay bales are *S. invicta*-free.



Fig. 2. Red imported fire ant mound built-up against square hay bale and hay ready for transport

Pine straw is the term used for fallen pine needles that are collected under pine trees. Fire ants may be gathered accidentally with the pine straw during the baling process. In January, 2004 APHIS, PPQ issued an Industry Alert urging pine straw retailers to protect their employees and customers from contact with fire ants

http://www.aphis.usda.gov/oa/pubs/ia_pinestraw.html

Research Objectives

Evaluate the efficacy, longevity, and effective rates and formulations of several candidate chemicals applied to support pallets or soil area, as barrier treatments, around apiculture equipment and hay bales in preventing *S. invicta* activity, such as foraging or nesting, on apiary equipment. Methods development for pine straw are being initiated in 2004.

General Methodology

Hay Treatments

Studies were conducted in south Mississippi in monogyne *Solenopsis invicta* dominated areas. Comparisons were made of the presence of IFA on hay bales placed on support pallets that were stacked on either chemically treated (Fig. 3a,b) or untreated bottom pallets (Fig. 3c). Similar comparisons were made between hay bales that were stacked on single support pallets placed directly on 10 x 10 ft chemically treated soil areas or untreated soil areas. Additionally, these comparisons were made between broadcast bait (Amdro®) treated areas and untreated areas within the field.



Fig. 3a. Pallet application

Fig. 3b. Chemicals

Fig. 3c. Hay on support pallets

For this hay study, 48 replicates were evaluated. Eight pallets were drenched with either deltamethrin [Deltagard® GC 5 SC (Bayer/Chipco)] at 0.44 ml/gal or permethrin [Gardstar® 40% EC Livestock and Premise Insecticide (Y-Tex)] at 10.0 ml/gal. Also, eight 10 x 10 ft plots were treated with either deltamethrin or permethrin as formulated for the pallet treatments. Soil treatments were applied at the 6.0 gal/plot rate. Hay was not stored directly on treated soil or pallets, but was stored on an untreated support pallet and hay bales set directly on untreated ground. A balanced design was used with treatments randomized within blocks.

Apiary Equipment Treatments

The approach to protecting apiary equipment was similar to that for hay treatments. Comparisons were made on the presence of IFA on apiary equipment on support pallets that were either chemically treated or untreated (Fig. 4). Also, comparisons were made between apiary equipment that was stacked on either 10 x 10 ft chemically treated soil areas or untreated soil areas. These comparisons were made between both pallet and soil methods in Amdro® broadcast bait treated areas and untreated areas of the field.



Three liquid chemicals were selected for evaluations; 1) chlorpyrifos [Dursban™ Pro (Dow AgroSciences)], 2) deltamethrin, and 3) permethrin. Four replicates of each chemical treatment and a set of untreated soil and pallet controls were evaluated in both bait treated and untreated areas. Treatments and controls were placed in a randomized block design in the field. Two bait-cards, soaked in vegetable oil, were placed on pallets or in the center of the 10x10 ft treated areas to detect IFA foraging.



Fig. 4. Apiary equipment on support pallets

Ant Sampling

Routine ant sampling (workers) and visual examinations (colonies) of hay stacks and apiary equipment were made 3-4 days post field placement and at weekly intervals for at least 6 weeks. A 2.5 x 2.5 cm. card soaked in corn oil and placed on top of pallets or the soil area was used as an attractant to determine the presence of foraging workers (Fig. 5). Cards were placed on pallets or directly on the soil for 30 minutes.



Fig. 5. Red imported fire ants on oil-soaked bait cards

Main Results

Hay

There were significant differences in IFA infestation rates among chemicals in this study (Fig. 6a), but less differences between soil and pallet applications. Both permethrin soil and pallet chemical applications provided excellent protection to bales from ant foraging and nesting behavior. The number of days in the field until first ant detection was greater than 45 days for both soil and pallet applications (Fig. 6a). Both soil and pallet applications of deltamethrin failed to provide satisfactory IFA protection (Fig. 6a). The number of days until first infestation was not significantly different between bait treated and untreated areas. However, the total number of active mounds detected on hay was significantly less in the treated side of the field (Fig. 6b) over the course of the three month study.

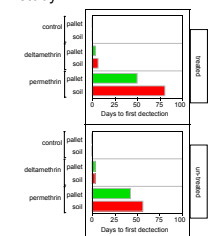


Fig. 6a. Graph of days until first IFA infestation

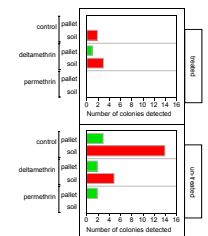


Fig. 6b. Graph of total number of colonies detected over the course of the study

Apiary Equipment

Both permethrin and chlorpyrifos provided better protection from IFA infestation compared to deltamethrin and control treatments (Figure 7a). Protection was on going at the conclusion of sampling, which ended after 45 days. Results from the broadcast bait applications show that the number of times IFA was detected on baits was half as much compared to baits in the untreated part of the field (Figure 7b).

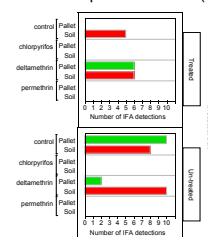


Fig. 7a. Graph of total number of infestations

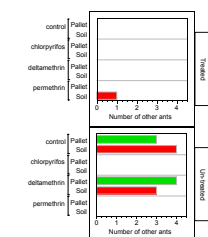


Fig. 7b. Graph of total number of other ants detected

Discussion

Permethrin soil and pallet applications worked well in both hay and apiary studies. It provided ca. 6 weeks of protection from IFA infestation. Although the single broadcast bait application to the field didn't significantly reduce the occurrence of foragers on hay bales, it did reduce the number active colonies in hay bales. Although foraging ants were able to find sampling cards on all of the bales, a repeated application of a broadcast bait may eliminate remaining colonies, and reduce the presence of individual foragers.

Both permethrin and chlorpyrifos applications (pallet and soil) used in the apiary evaluations provided excellent protection from IFA infestation. Permethrin is currently used by beekeepers to control hive beetle.

Studies are being conducted in the ARS bee laboratory in Arizona to determine the impact of liquid chemical and broadcast chemical applications aimed at IFA on honey bee mortality, foraging, and colony growth. Results from those studies are forthcoming

Disclaimer: Mention of trade names or proprietary products does not constitute an endorsement or recommendation for use by the U.S. Department of Agriculture. Statements may be based on preliminary or uncompleted experiments; therefore, the data are not ready for publication or public distribution. Many ants were killed and injured while conducting these studies.